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Lines et al.

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(54) **NON REAL-TIME FACSIMILE SYSTEM FOR A COMPUTING DEVICE**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 619 days.

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(22) Filed: **Jul. 3, 2001**

(51) **Int. Cl.**[7] **H04M 11/00**
(52) **U.S. Cl.** **379/100.09**; 379/100.01; 358/407; 710/72
(58) **Field of Search** 379/100.01, 100.06, 379/100.09, 100.11, 100.12, 100.17; 358/400–403, 407, 442–444, 468; 710/72

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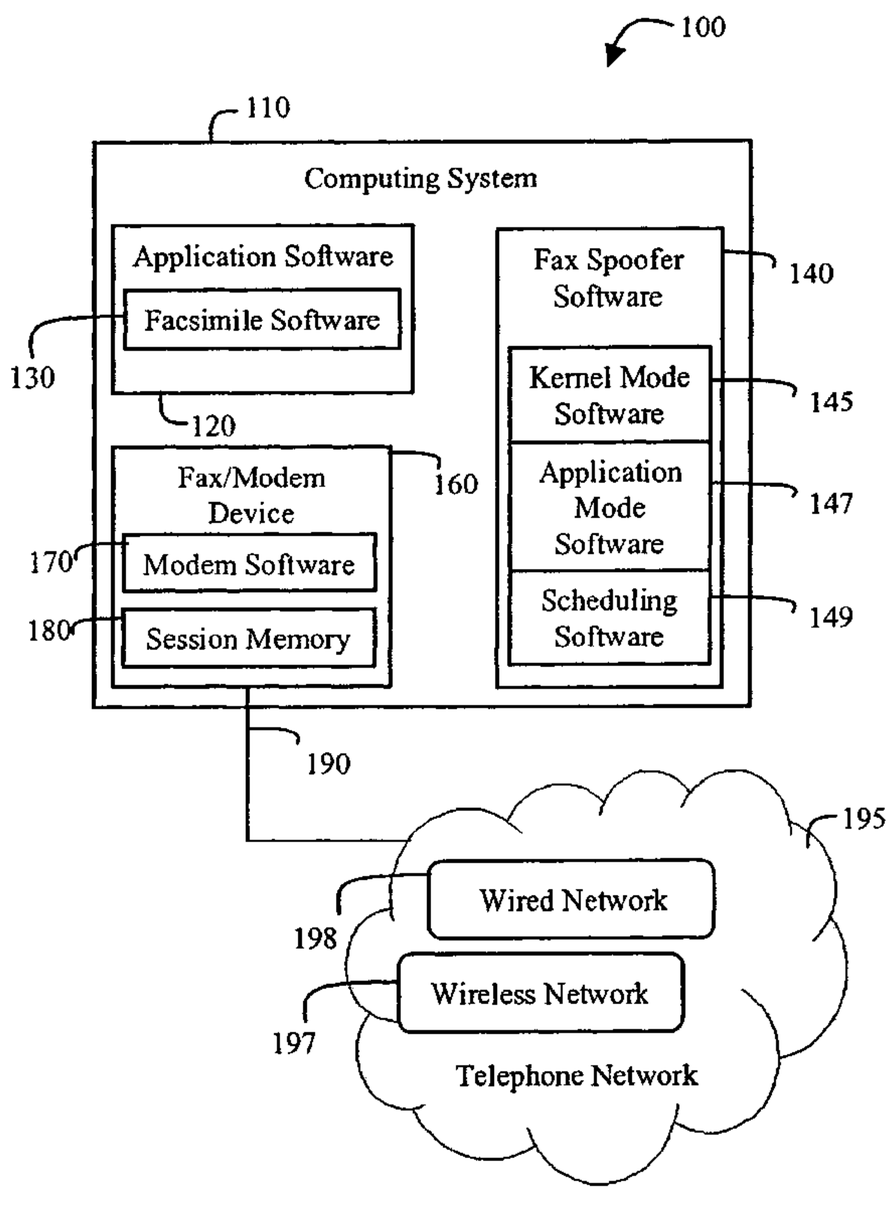
Primary Examiner—Wing Chan
(74) *Attorney, Agent, or Firm*—Christopher J. Rourk; Godwin Gruber, LLP

(57) **ABSTRACT**

The invention describes a non-real time fax transmission and reception system, in which fax emulation or "spoofer" software resides between application software and a fax/modem device. The fax/modem device may be comprised of hardware or software in any proportion. The fax spoofer software uses a fax/modem emulator to interface between requesting application software to have the application software believe that it is communicating with an actual, as opposed to virtual, fax/modem device. The emulator creates a class 1 or class 2 fax/modem session of the transmission request, which may be transmitted to a fax/modem device at a later point in time. Additionally, the fax spoofer software may be used to buffer, queue, or process incoming facsimiles, which can either be stored in the local memory of a fax/modem device or in the memory portion of the fax spoofer software. The incoming facsimile session is recorded in a buffer, and routed to the emulation software that processes the incoming fax/modem session into fax data deliverable to a destination application. Accordingly, incoming faxes need not interrupt the operation of the computing system. Additionally, temporary unavailability of system resources will not result in a termination of the facsimile session or failure of the transmission. The fax spoofer software may be located across several different computers in a networked environment. In a network environment, a fax/modem hub may be created to route incoming or outgoing facsimiles to different client computing systems. Storage or processing of the fax/modem sessions may take place either at the hub level or at the client level.

16 Claims, 12 Drawing Sheets



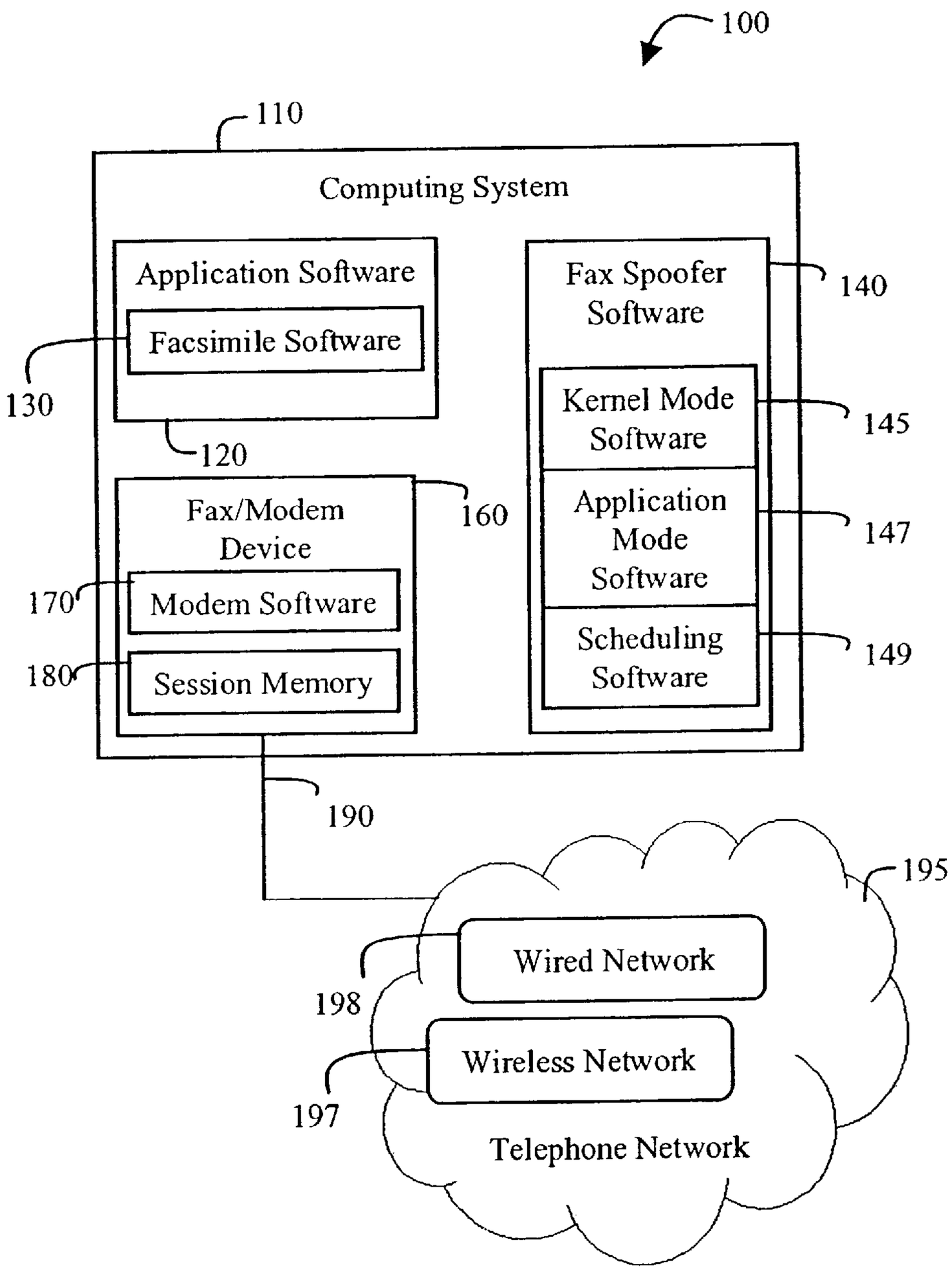

100
110
Computing System
Application Software
Facsimile Software
130
120
Fax Spoofer Software
140
Kernel Mode Software
145
Application Mode Software
147
Scheduling Software
149
Fax/Modem Device
160
170
Modem Software
180
Session Memory
190
195
Wired Network
198
Wireless Network
197
Telephone Network

Figure 1

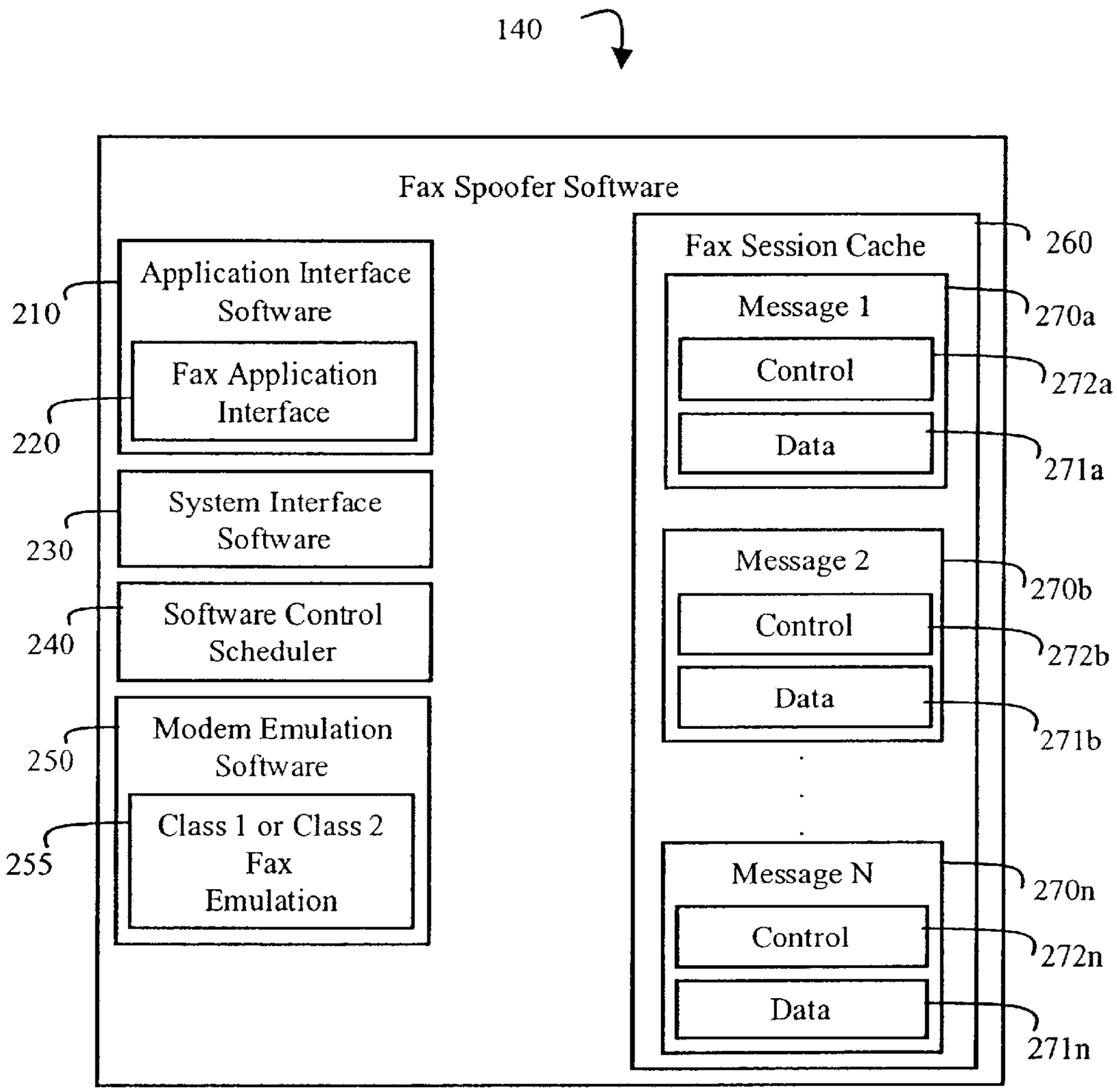

140
Fax Spoofer Software
Application Interface Software
Fax Application Interface
System Interface Software
Software Control Scheduler
Modem Emulation Software
Class 1 or Class 2 Fax Emulation
Fax Session Cache
Message 1
Control
Data
Message 2
Control
Data
Message N
Control
Data
210
220
230
240
250
255
260
270a
272a
271a
270b
272b
271b
270n
272n
271n

Figure 2

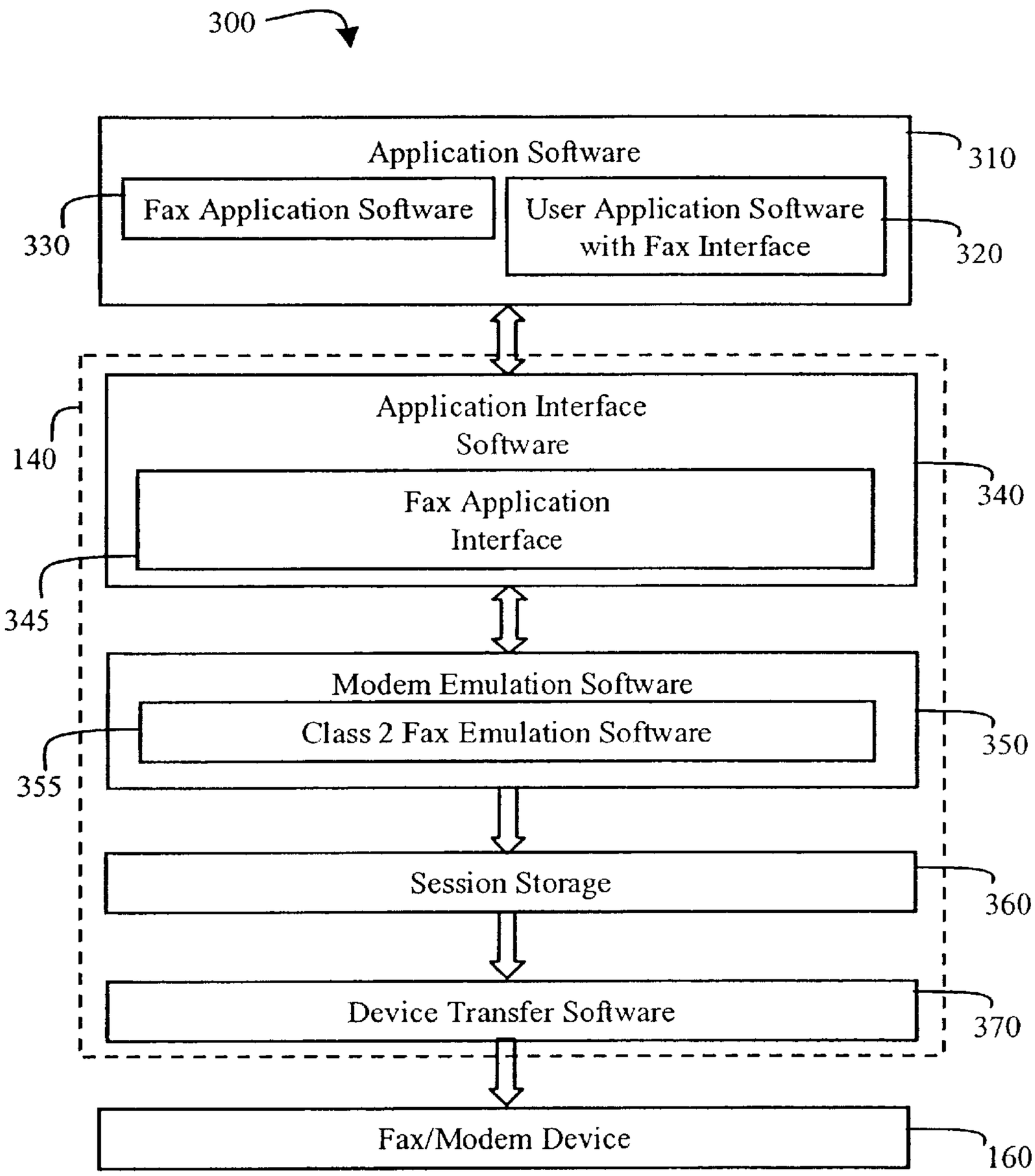

300
Application Software
310
Fax Application Software
330
User Application Software with Fax Interface
320
Application Interface Software
140
Fax Application Interface
345
340
Modem Emulation Software
Class 2 Fax Emulation Software
355
350
Session Storage
360
Device Transfer Software
370
Fax/Modem Device
160

Figure 3

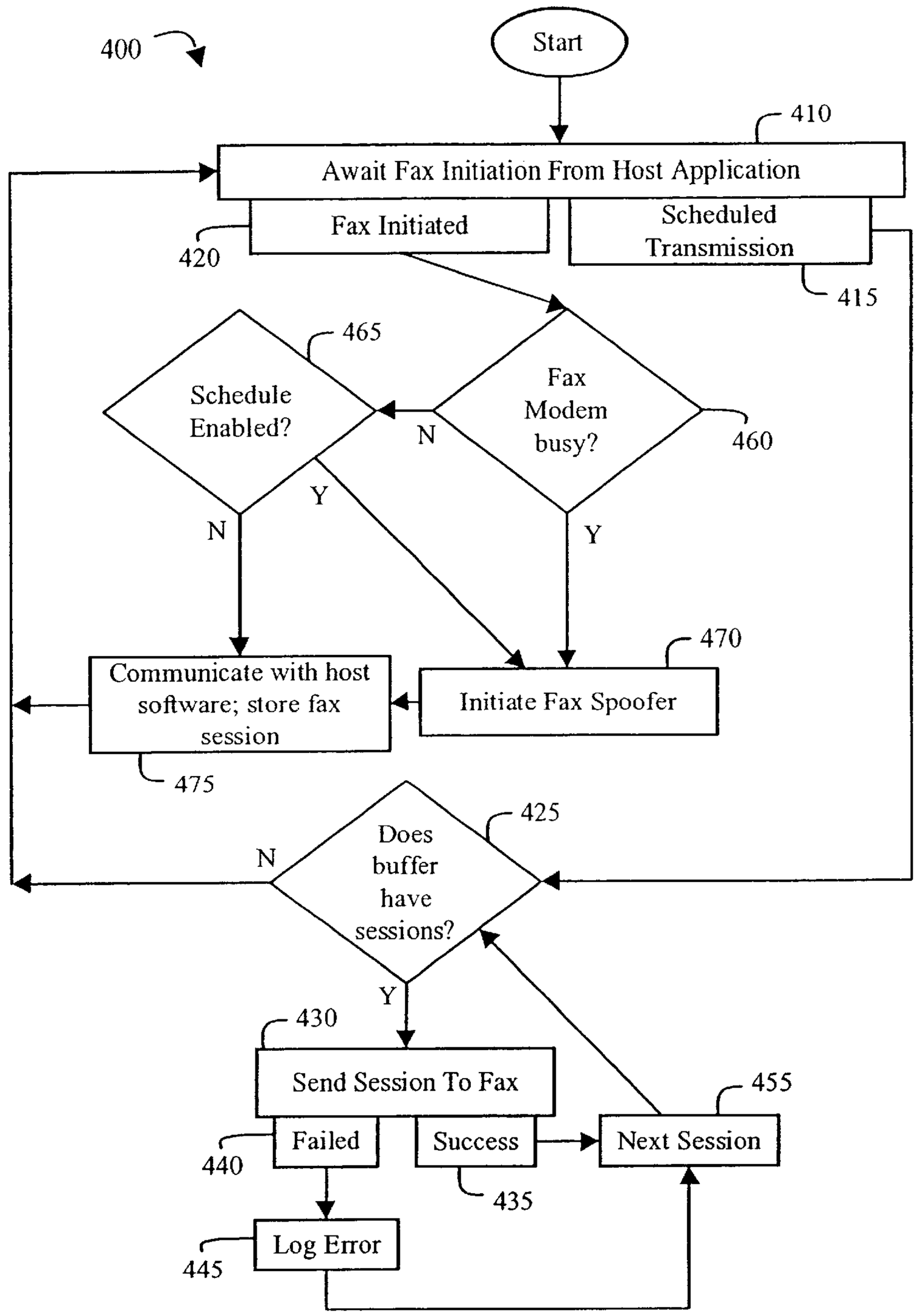

400
Start
410
Await Fax Initiation From Host Application
Fax Initiated
420
Scheduled Transmission
415
465
Schedule Enabled?
Fax Modem busy?
460
N
Y
N
Y
470
Communicate with host software; store fax session
Initiate Fax Spoofer
475
425
Does buffer have sessions?
N
Y
430
Send Session To Fax
455
Failed
Success
Next Session
440
435
Log Error
445

Figure 4

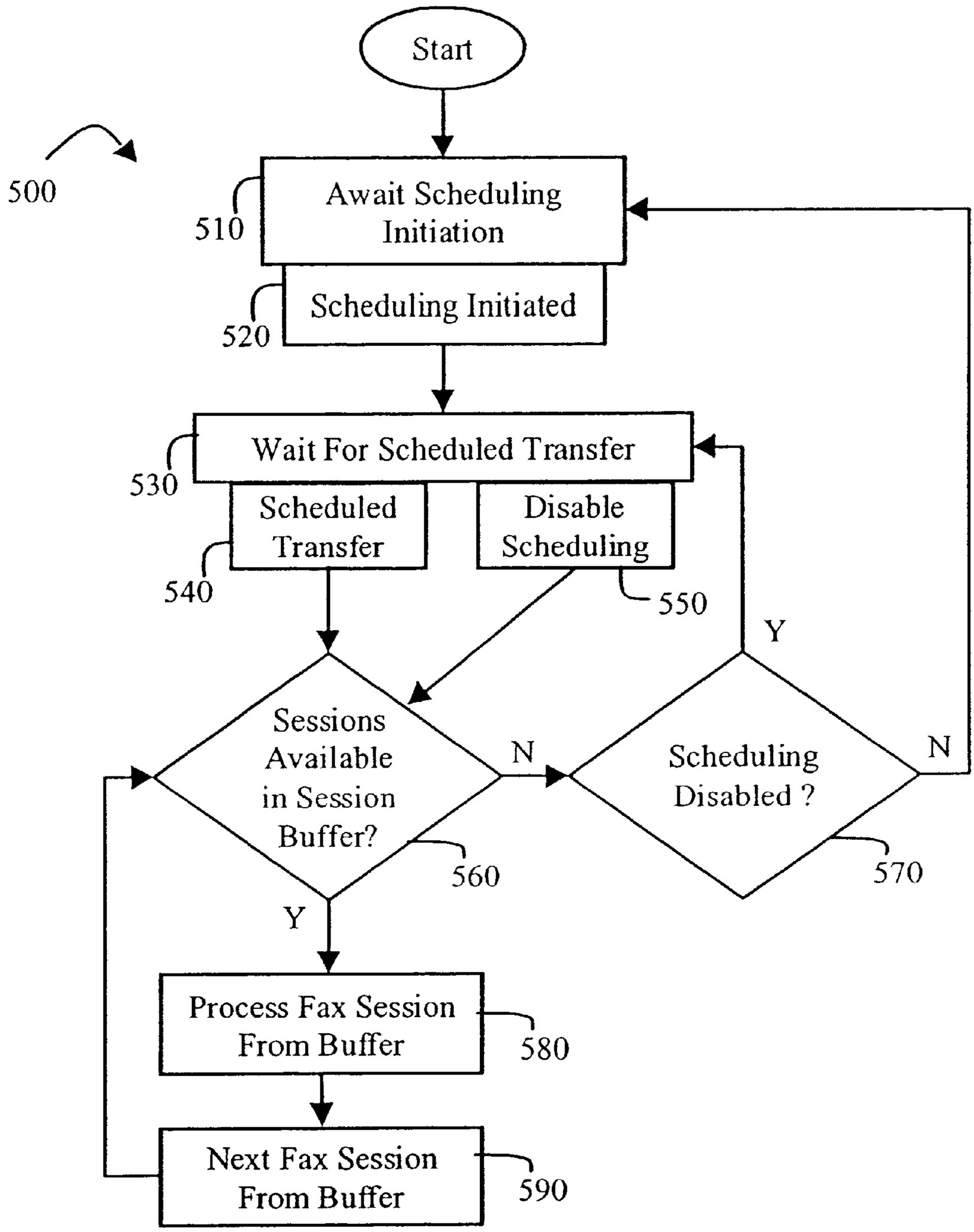

Start
500
Await Scheduling Initiation
510
Scheduling Initiated
520
Wait For Scheduled Transfer
530
Scheduled Transfer
540
Disable Scheduling
550
Sessions Available in Session Buffer?
560
N
Y
Scheduling Disabled ?
570
N
Y
Process Fax Session From Buffer
580
Next Fax Session From Buffer
590

Figure 5

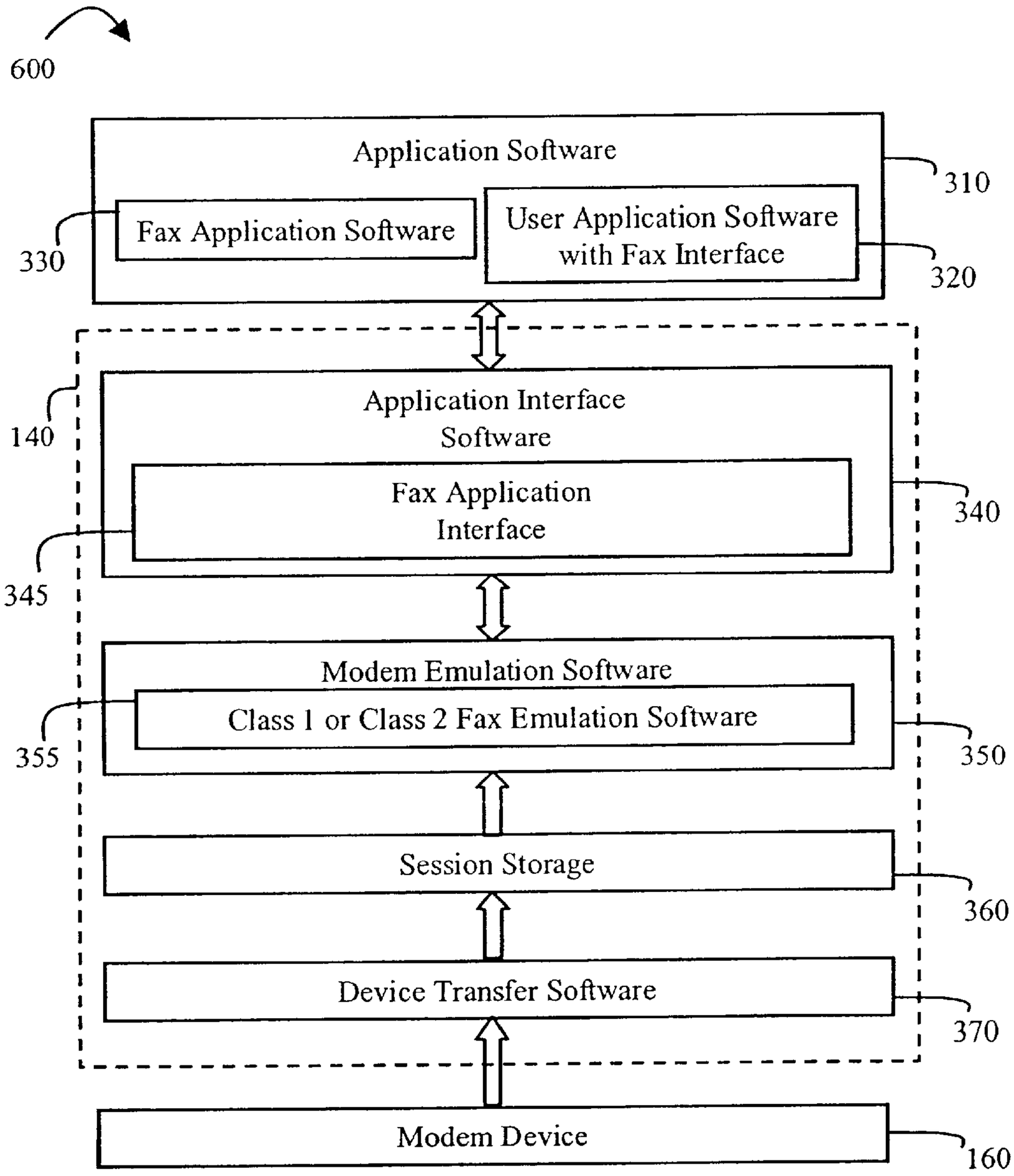

600
Application Software
310
Fax Application Software
330
User Application Software with Fax Interface
320
Application Interface Software
140
Fax Application Interface
345
340
Modem Emulation Software
Class 1 or Class 2 Fax Emulation Software
355
350
Session Storage
360
Device Transfer Software
370
Modem Device
160

Figure 6

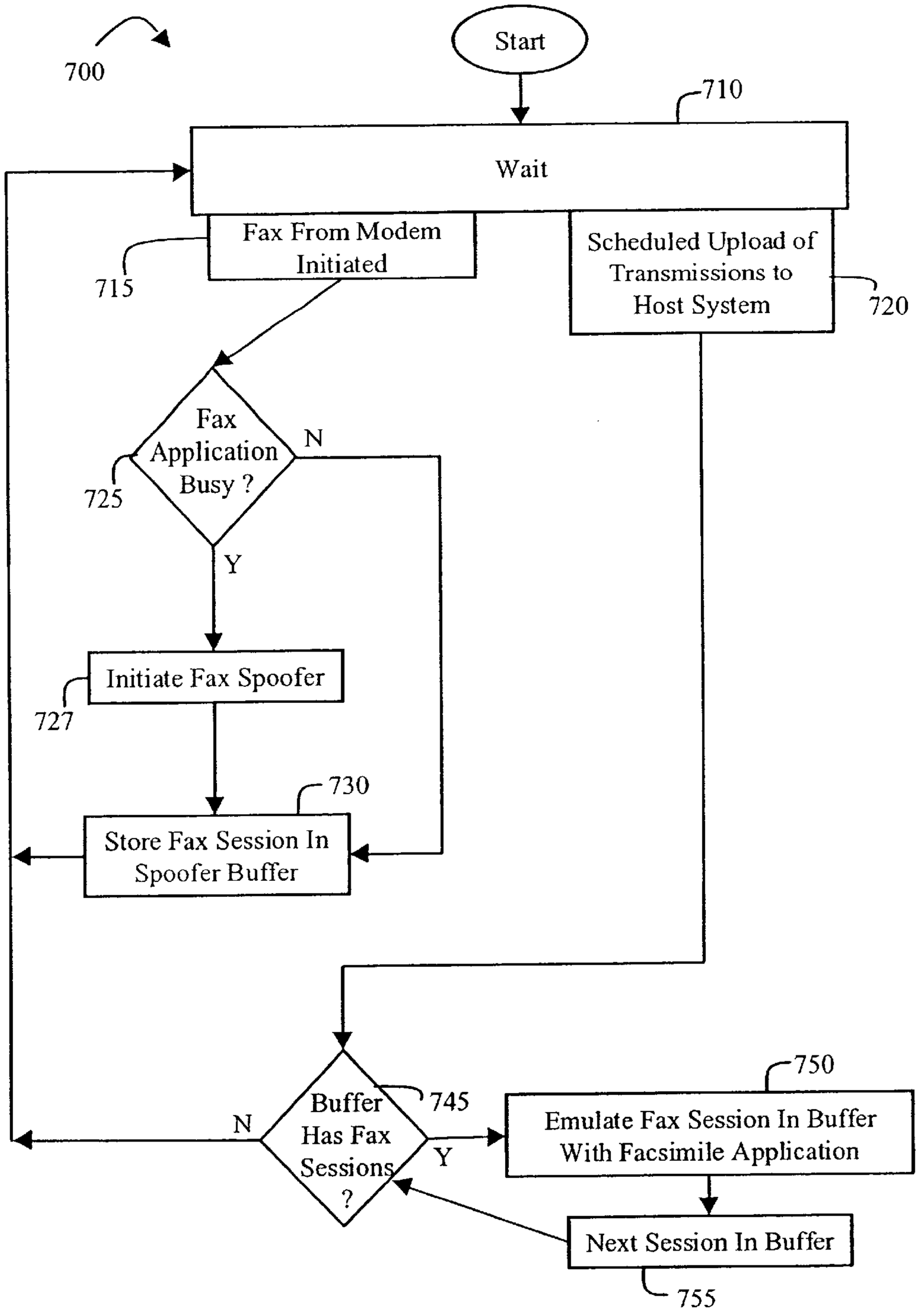

700
Start
710
Wait
Fax From Modem Initiated
715
Scheduled Upload of Transmissions to Host System
720
Fax Application Busy ?
725
N
Y
Initiate Fax Spoofer
727
730
Store Fax Session In Spoofer Buffer
Buffer Has Fax Sessions ?
745
N
Y
750
Emulate Fax Session In Buffer With Facsimile Application
Next Session In Buffer
755

Figure 7

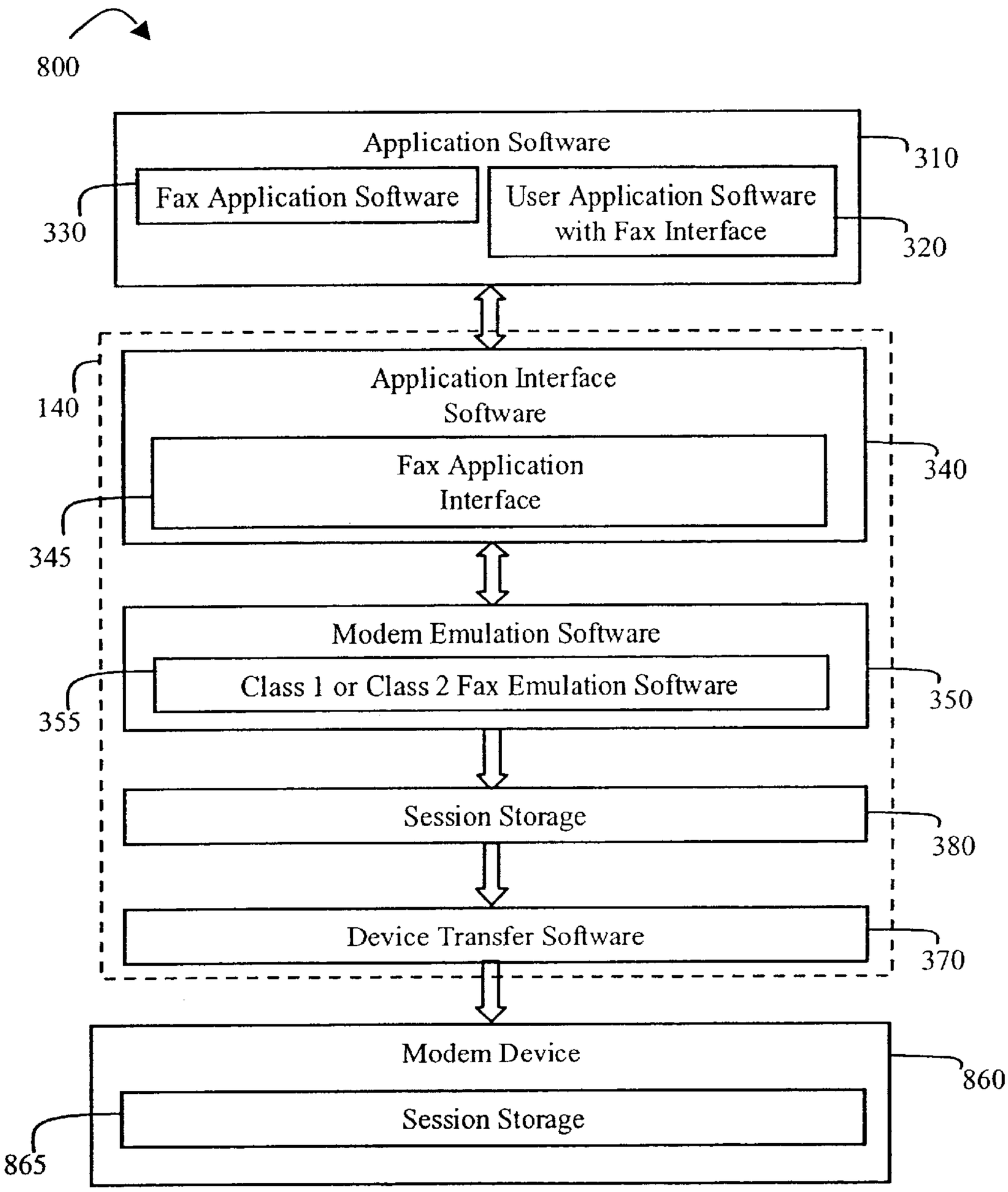

800
Application Software
310
Fax Application Software
330
User Application Software with Fax Interface
320
Application Interface Software
140
Fax Application Interface
345
340
Modem Emulation Software
Class 1 or Class 2 Fax Emulation Software
355
350
Session Storage
380
Device Transfer Software
370
Modem Device
860
Session Storage
865

Figure 8

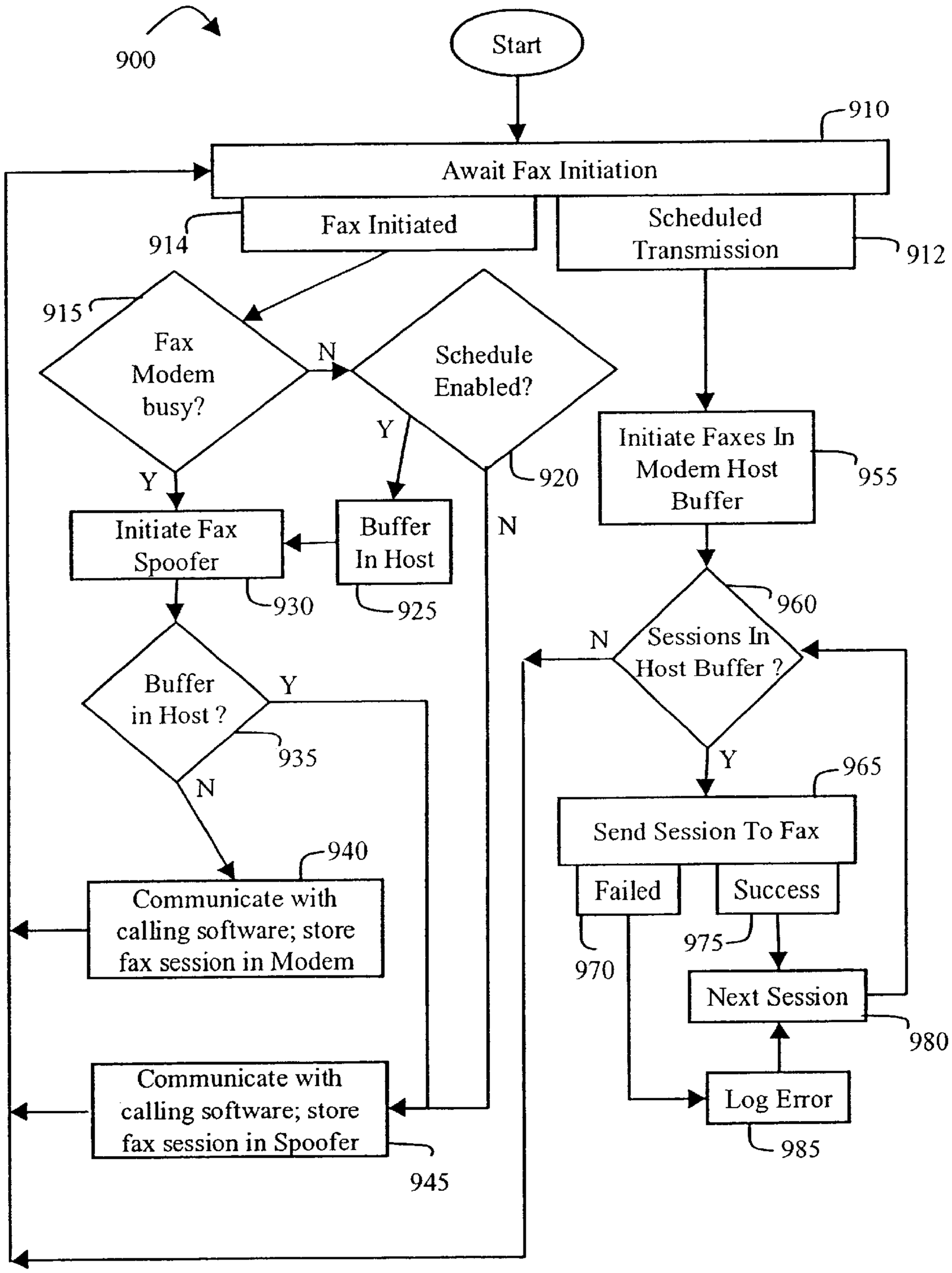

900
Start
910
Await Fax Initiation
914
Fax Initiated
Scheduled Transmission
912
915
Fax Modem busy?
N
Schedule Enabled?
Y
920
N
Y
Initiate Fax Spoofer
930
Buffer In Host
925
Buffer in Host ?
935
Y
N
940
Communicate with calling software; store fax session in Modem
Communicate with calling software; store fax session in Spoofer
945
Initiate Faxes In Modem Host Buffer
955
960
N
Sessions In Host Buffer ?
Y
965
Send Session To Fax
Failed
Success
970
975
Next Session
980
Log Error
985

Figure 9

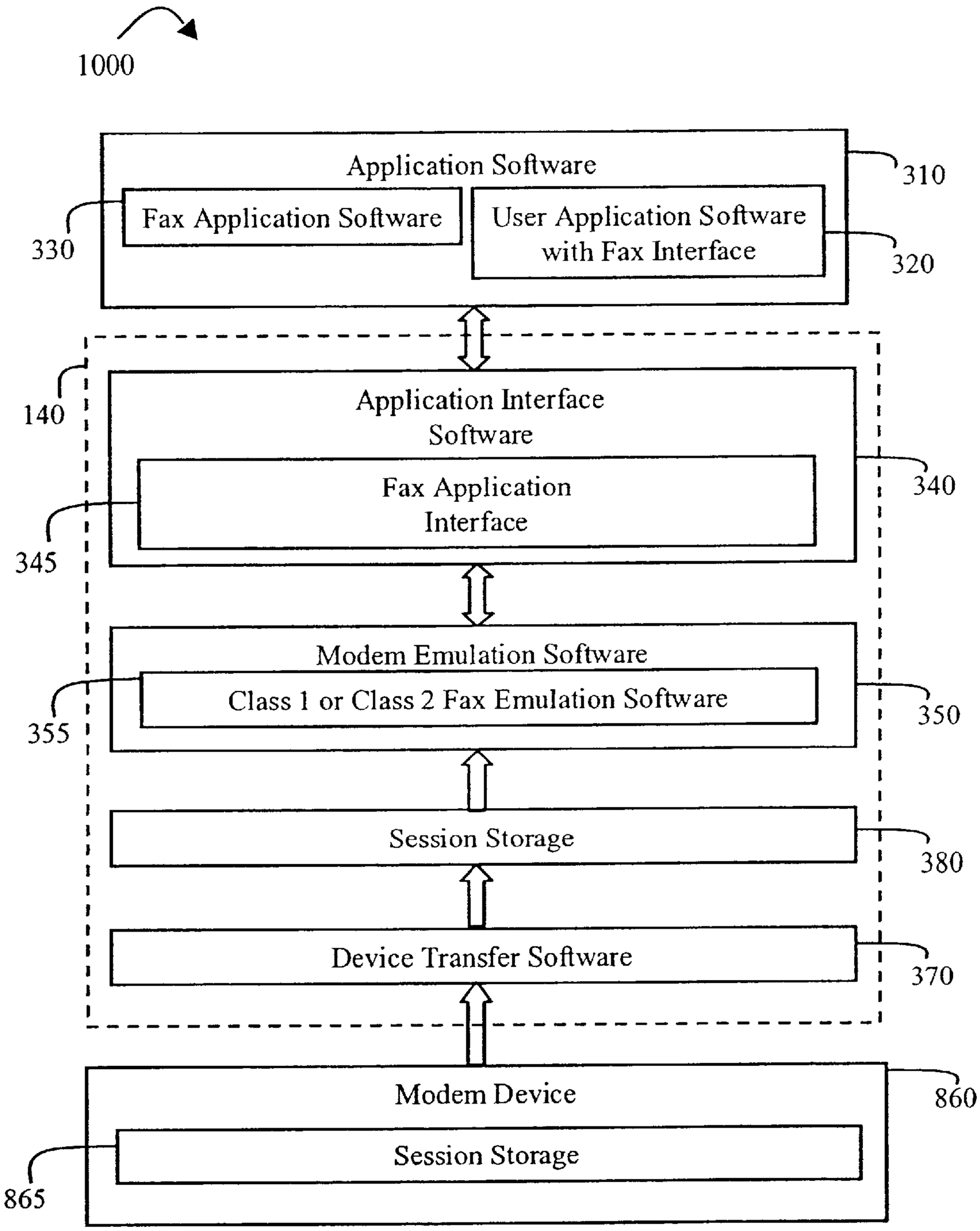

1000
Application Software
310
Fax Application Software
330
User Application Software with Fax Interface
320
140
Application Interface Software
Fax Application Interface
345
340
Modem Emulation Software
Class 1 or Class 2 Fax Emulation Software
355
350
Session Storage
380
Device Transfer Software
370
Modem Device
860
Session Storage
865

Figure 10

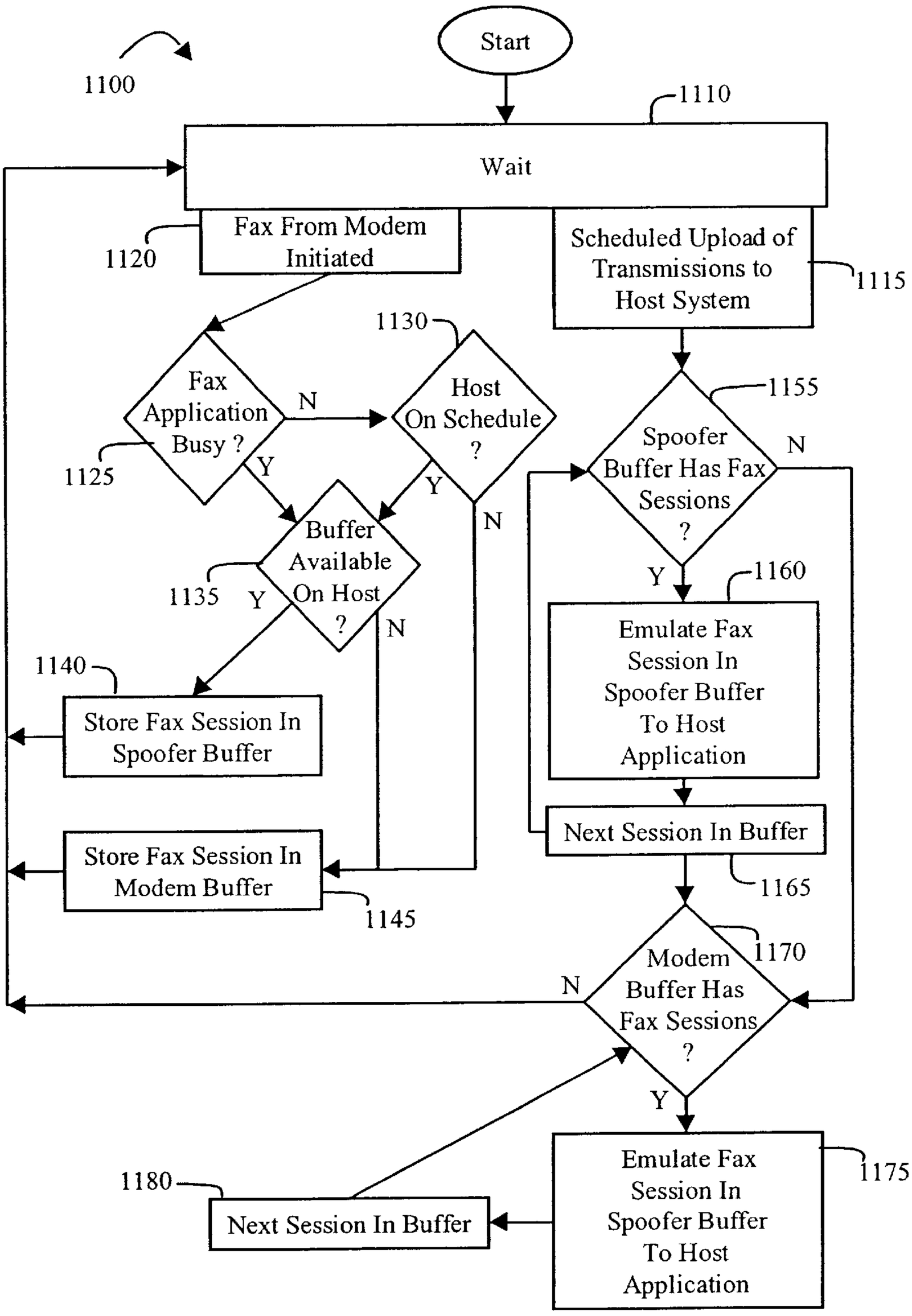

Start
1100
1110
Wait
Fax From Modem Initiated
1120
Scheduled Upload of Transmissions to Host System
1115
1130
Fax Application Busy ?
1125
N
Host On Schedule ?
Y
N
Buffer Available On Host ?
1135
Y
N
1140
Store Fax Session In Spoofer Buffer
Store Fax Session In Modem Buffer
1145
1155
Spoofer Buffer Has Fax Sessions ?
N
Y
1160
Emulate Fax Session In Spoofer Buffer To Host Application
Next Session In Buffer
1165
1170
Modem Buffer Has Fax Sessions ?
N
Y
Emulate Fax Session In Spoofer Buffer To Host Application
1175
1180
Next Session In Buffer

Figure 11

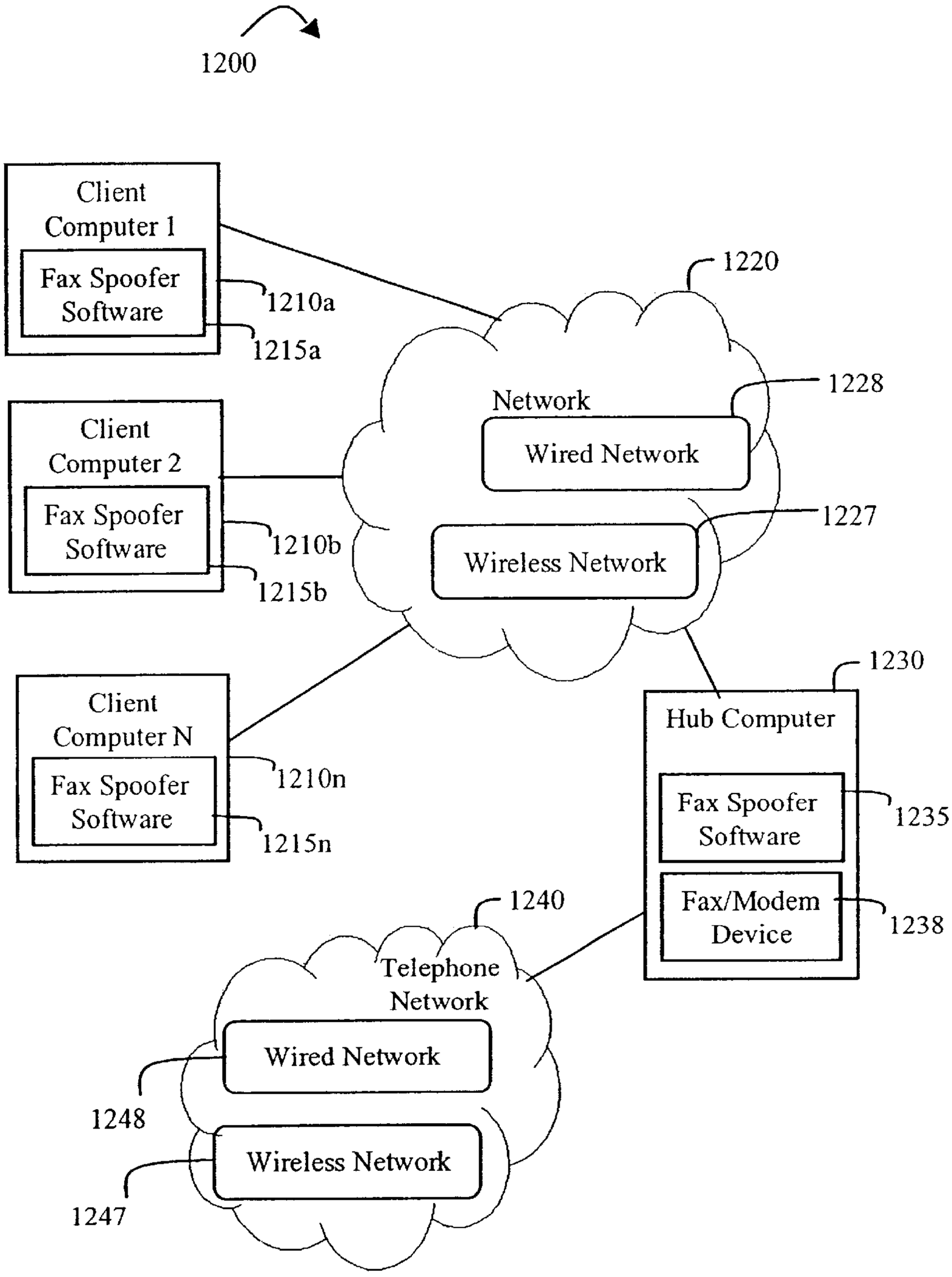

1200
Client Computer 1
Fax Spoofer Software
1210a
1215a
Client Computer 2
Fax Spoofer Software
1210b
1215b
Client Computer N
Fax Spoofer Software
1210n
1215n
1220
Network
1228
Wired Network
1227
Wireless Network
1230
Hub Computer
Fax Spoofer Software
1235
Fax/Modem Device
1238
1240
Telephone Network
Wired Network
1248
Wireless Network
1247

Figure 12

NON REAL-TIME FACSIMILE SYSTEM FOR A COMPUTING DEVICE

BACKGROUND

1. Technical Field

The present invention is directed to a dynamic facsimile ("fax") transmission system and method that enables the non-real time transmission of faxes from a computing device. More precisely, the present invention is directed to a non-real time or semi-real time fax transmission system and method in which the associated computing devices, either locally or across a network, emulate a class 1 or class 2 facsimile machine and modem, and store the emulated facsimile/modem sessions for transmission at a later time. The present invention is also directed to means by which a modem spoofer software component may be used in retrieving facsimile transmissions from either a facsimile/modem device, where the facsimile/modem session is stored in the fax/modem device or in a memory of the computing device.

2. Related Art

Many conventional computer systems employing a facsimile/modem device are connected to the fax/modem device by a single band-limited connection, such as a serial port. Attempts have been made to read or write class 1 or class 2 fax commands and data to an attached fax device over an IEEE 1284 parallel port on a designated extended capability port ("ECP") protocol. The ECP protocol provides a high performance bi-directional communication path between the first adapter and designated peripheral and, thus, provides both data cycle and command cycle paths in both forward and reverse directions.

Accordingly, using a parallel port is problematic if data traffic is travelling over the port on other channels. Additionally, the IEEE 1284 specification allows delays for signals to change, and additional time is needed to switch the ECP channel. These delays make it difficult to meet the real time requirements of class 1 or class 2 fax/modems in a personal computer ("PC")-based fax application.

Additionally, telephone lines or PC-to-fax communications often have limited bandwidths for response time, thereby making it difficult to send or receive a fax in real time using common fax applications, such as WinFax®, LaserFax®, or HotFax®.

The success or failure of any fax transmission based upon a simple dedicated PC-to-fax communication is dependent on the speed of the communication link between the PC and the fax device. Additionally, the success or failure of any fax transmission is dependent on the timing requirements of the associated fax application or any other embedded fax interface associated with another type of application, such as the "print-to-fax" options found in many popular software applications.

Finally, many conventional fax/modem devices do not have storage means for the fax data in the fax device when an attached PC is busy. Accordingly, an incoming fax will fail to transmit when the PC is busy and unable to upload the fax at the time of reception. Additionally, the PC will not be able to respond to the incoming fax reception at a later time, as the communication channel has been closed to the incoming reception.

Many other problems, disadvantages, and deficiencies of the prior art will become apparent to one skilled in the art after comparing such prior art with the present invention as described herein.

BRIEF DESCRIPTION OF THE FIGURES

FIG. **1** is a schematic block diagram of a fax transmission and reception system built in accordance with the present invention.

FIG. **2** is a functional block diagram of the fax spoofer software of FIG. **1**.

FIG. **3** is a combination flow diagram and functional block diagram describing the possible components of the fax spoofer software of FIG. **1**.

FIG. **4** is a data flow diagram of the possible operation of the fax spoofer software of FIG. **2**.

FIG. **5** is a flow diagram detailing the operation of scheduled transmissions of stored facsimile sessions by the fax spoofer of FIG. **2**.

FIG. **6** is a combination flow diagram and functional block diagram describing the possible components of the fax spoofer software of FIG. **1** during the receipt of an incoming facsimile from a fax/modem device.

FIG. **7** is a data flow diagram of an additional possible operation of the fax spoofer software of FIG. **2**.

FIG. **8** is a combination flow diagram and functional block diagram describing additional possible components of the fax spoofer software of FIG. **1**.

FIG. **9** is a data flow diagram of the possible operation of the fax spoofer software of FIG. **8**.

FIG. **10** is a combination flow diagram and functional block diagram describing the possible components of the fax spoofer software of FIG. **1** during the receipt of an incoming facsimile from a fax/modem device having its own session storage area.

FIG. **11** is a data flow diagram of the possible operation of the fax spoofer system of FIG. **10**.

FIG. **12** is a schematic block diagram of the present invention in a network environment where a fax "hub" is created.

SUMMARY

Various aspects of the invention may be found in a facsimile system for a computer system. The facsimile system is communicatively coupled to a modem that is capable of acting as a facsimile device. The facsimile system may have several functional portions, including a computer system interface, a modem emulator, and a modem interface.

The computer system interface is communicatively coupled to the computer system and receives data for an outgoing facsimile transmission through the modem. The modem emulator is communicatively coupled to the computer system, and receives data from the computer system for transmission as a facsimile through the modem. The modem interface is also communicatively coupled to the modem emulator, and passes the data received by the modem emulator to the modem.

The modem emulator emulates a modem while receiving the data destined for the modem. Thus, to the computer system, it appears that the ongoing outgoing facsimile is being processed by the modem. In fact, the modem emulator is processing the outgoing facsimile transmission. In an exemplary aspect, the modem emulator has a class 1 or class 2 facsimile machine emulator, or both.

Another aspect of the facsimile system may be realized with a facsimile session queue. The facsimile session queue is communicatively coupled to the modem emulator, and stores the data received from the computer system for transmission.

The facsimile system may also have a scheduler. The scheduler is communicatively coupled to the modem interface. The scheduler directs the facsimile system when the outgoing facsimiles received from the computer system will be sent to the modem. The scheduler can base the point at which the facsimile data is transferred to the modem for transmission to a remote party on any of a number of preselected criteria.

For example, the scheduler may determine to send the facsimile data to the modem based on a number of facsimile messages to be sent. Or, the scheduler may base the transmission time on an amount of space left or an amount of space occupied in the stored session queue. Or the scheduler may have a preset time at which to transmit the facsimile data, or have preset delays.

Or, the facsimile system may store the data when the modem is otherwise occupied. When the modem is unoccupied, the transmission may then occur. In this manner, the facsimile system transmits the data to the modem at a later time than it receives the data from the computer system.

In another aspect of the invention, incoming data from other remote facsimile devices is stored. The storage may take place either in the facsimile system or elsewhere in the computer system. At a later time, the facsimile system enables the computer system to process such a facsimile. This may take place through the use of the modem emulator, as it may emulate a modem or facsimile device using the stored incoming data in communicating that data to the computer system.

Another aspect of the invention may be found in a method of operating a facsimile device on a computing system. The computing system is communicatively coupled to a modem. An interface would receive a request to transmit a facsimile from the computing system, and then check the availability of the modem to transmit the facsimile. The interface would then emulate a modem to computing system and transmit the facsimile at a later time.

In one aspect, the interface would check the availability of the modem through checking a scheduler to determine if the modem can send the facsimile at the time of the request. Or, the scheduler may operate as described previously in selecting the point of transmitting the data received from the computing system based on various preselected criteria.

Another aspect of the method may include receiving and storing the facsimile data in a session buffer. In this manner, many outgoing facsimiles may be stored for later transmission by the coupled modem.

In another aspect, the modem is communicatively coupled to the computing system over a network. As such, a modem hub may be made for one or more computing devices.

DETAILED DESCRIPTION

FIG. **1** is a schematic block diagram of a fax transmission and reception system built in accordance with the present invention. A facsimile transmission and reception system **100** comprising a computing system **110** is linked to a telephone network **195** through a communications link **190**. The telephone network **195** may contain a wireless network **197** or a wired network **198**.

The computing system **110** runs an application software component **120**, and/or a facsimile interface software component **130**. The application software may be any one of a number of popular applications, including Microsoft Word®, graphics applications, database applications, or other widely available software.

If the application software component **120** does not contain an integrated fax component, the computing system **110** contains the facsimile software **130**, which allows the computing system **110** to send a facsimile of data files contained on the computing system to any of a number of recipients over the communications link **190**, and through the telephone network **195**. Or, the application software **120** may allow for the direct transmission of faxes from within the application software **120** in substantially the same manner.

Additionally, the computing system **110** may receive faxes. The facsimile software **130** allows the computing system **110** to receive faxes from remote senders through the communications link **190** and from the telephone network **195**.

Both the application software **120** and the facsimile software **130** perform the functions described above via a fax/modem device **160**. The fax/modem device **160** links the computing system **110** to the telephone network **195** through the communications link **190**, which can be a variety of sources, including both wired and wireless connections.

The fax/modem device **160** need not be integral to the computing system **110**, but may be communicatively coupled to the computing system **110** over many types of communication links. These communications links may be achieved through wired communications links over a serial port, parallel port, Universal Serial Bus ("USB") port, SCSI port, or through a wired network connection such as, for example, an Ethernet connection. Additionally, the fax/modem device **160** may be communicatively coupled to the computing system **110** through either a wireless radio communications link or through an infrared communications link.

Additionally, the fax/modem device **160** is not necessarily completely embodied in hardware components. The fax/modem device may be comprised of modem software **170** and hardware components, with the hardware portions and the software portion **170** located either within or without the computing system **110** or in any combination thereof.

The fax/modem device may contain a session memory portion **180** to which incoming transmissions may be buffered. Or, the fax/modem device may employ a portion of the memory of the computing system **110** to buffer incoming and outgoing transmissions.

In the non-real time fax transmission system and method, the user indicates to the facsimile software **130** that the user wishes to send a facsimile transmission to a remote user. The user enters the appropriate data through the facsimile software **130**, typically telephone number, sender, recipient, and any additional messages that the user wishes to send to the remote recipient. The user may also select data files resident on the computing system **110** to be attached to an outgoing facsimile.

The facsimile software **130** sends the proposed facsimile to a fax spoofer software component **140**. The fax spoofer software **140** then determines if the fax/modem device is currently busy or otherwise out of communication with the computing system **110**. If the fax/modem device is unavailable, the fax spoofer device accepts the data provided by the facsimile software **130** and emulates the functions of a class 1 or class 2 fax/modem on the data provided by the facsimile software **130**. Thus, the facsimile software **130** is unaware of the unavailability of the fax/modem device **160**, and believes that it transmitting to an actual fax/modem device.

Similarly, the application software **120** communicates with the fax spoofer software **140** when a user wishes to

send a document or data from the application software **120** to a remote user through the telephone network **195**. Typically, the facsimile software **130** accesses other portions of the computing system **110** to create attachments to send to remote users. The user of the application software **120** typically wishes to simply send the contents of the user's current data file in the application software **120** through the fax/modem device to a remote user.

Similar to the method described above in relation to the facsimile software **130**, the application software **120** communicates with the fax spoofer software **140**. Thus, the fax spoofer software can capture an outgoing facsimile session destined for transmission over the telephone network **195** when the fax/modem device **160** is occupied or otherwise out of communication with the computing system **110**.

If the fax/modem **160** is not in communication with the computing device **140**, the fax spoofer software **140** parses modem commands from the requesting software and sends the correct responses back to the requesting software. The requesting software may be either the facsimile software **130** or the application software **120**.

Thus, the fax spoofer **140** enables the requesting software to believe that it is communication with the actual fax/modem device **160** in real time. The fax spoofer program **140** parses modem commands, such as AT commands and other class 1 or class 2 fax commands, to enable the fax spoofer program **140** to respond correctly to the facsimile software.

The fax spoofer program **140** may contain a kernel mode WDM driver **145** and a user mode helper application **147**. The kernel mode driver **145** of the fax spoofer program **140** may best be suited to monitor and capture data for a designated serial port associated with the fax/modem device **160**, depending upon the type of operating system in use.

The kernel mode driver **145** of the fax spoofer program is communicatively coupled to the user mode helper program **147** of the fax spoofer software **140**. The kernel mode driver **145** communicates with the user mode helper application **147** to transfer fax image data and control information (such as data format, phone number, etc.) between the kernel mode driver **145** and the user mode helper application **147**. Once the fax data has been transferred to the user mode helper application **147**, the fax data can be transmitted to the fax/modem device **160** immediately, or stored to be sent at a later time.

The fax spoofer software **140** may also have a scheduling mechanism **149**, which allows the computing system **110** to send facsimiles at specified times and conserves system resources by allowing the user to send faxes efficiently.

During an incoming facsimile transmission, the incoming message is transmitted to the fax/modem device **160** from the telephone network **195** through the communications link **190**. The fax spoofer software **140** monitors the fax/modem device **160** for incoming transmissions from a remote user. When a fax transmission request is detected, the fax spoofer software **140** then determines whether the computing system **110** is now able to receive and process a facsimile transmission.

The fax spoofer software **140** determines the availability of the communication connection between the fax/modem device **160** and the remainder of the computing system **110**, determines the availability of the computing system **110**, and determines whether the scheduling portion of the fax spoofer software **140** calls for an incoming transmission. If all of these conditions are met, then the facsimile reception proceeds.

If the fax/modem device **160** determines that either the connection between the fax/modem device **160** and computing system **110** or that the computing system **110** itself is unavailable, the fax/modem device **160** can store the entire fax/modem session in an attached session memory **180**. The session memory **180** may be local to the computing system **110**, local to the fax/modem device **160**, or be allocated in any proportion between the computing system **110** and the fax/modem device **160**.

If the attached session memory **180** is local to the fax/modem device **160**, the fax/modem device **160** transfers the contents of the session memory **180** to the fax spoofer software **140** at the appropriate time. The fax spoofer software **140** then stores the contents of the session memory **180**. The fax spoofer software **140** may process the data into an incoming facsimile on a non real-time basis or the fax spoofer software **140** may interface to the application software **120** or the facsimile software **130** as an emulator according to the data.

When the attached session memory **180** is local to the computing system **110**, the fax/modem device **140** transfers the contents of the facsimile session to the facsimile session memory **180**. The fax/modem device **160** may store some of the session data for later transmittal to the computing system **110** at a slower speed, thereby allowing the computing system **110** to focus on its ongoing operations without having to copiously oversee the operation of the fax/modem device **160**.

The fax spoofer software **140** may store the contents of the session memory **180** for processing into an incoming facsimile on a non real-time basis. Or, the fax spoofer software may act as a modem emulator relative to the application software **120** or the facsimile software **130**.

When the scheduling mechanism **149** will not allow for the transmission and processing of an incoming fax from the fax/modem device **160**, the fax/modem device **160** can transfer the recorded session directly to the fax spoofer software **140**. The fax spoofer software **140** then processes the incoming fax in the appropriate manner.

Or, if the fax/modem device **160** contains an amount of session memory **180**, the fax spoofer software **140** may indicate to the fax/modem device **160** to store all sessions in the session memory **180**. This data would be stored until the scheduling parameters of the fax spoofer software **140** allow an upload of fax sessions to the fax spoofer for further processing.

Accordingly, received faxes may be stored in the fax/modem device **160** until the computing system **110** is available to upload the faxes, which allows the user to employ one of the commonly available fax applications to upload received faxes from the fax/modem devices **160**. The user does not have to resort to custom designed software specific to a particular fax/modem device **160**. Software developers also will not need to generate custom fax applications for each additional fax/modem device or associated application software, thereby saving development time for all concerned.

Outgoing faxes may also be spooled and sent to the fax/modem device **160**, which allows for additional economy of resources because the application software **120** and the facsimile software **130** will be insulated from the operations of the fax/modem device **160**. This further economizes telephonic resources because outgoing facsimiles can be spooled and sent in a batch, rather than intermittently.

Additionally, the success or failure of fax transmissions is now independent of the speed of the communications link

190 between the computing system 110 and the fax/modem device 160 and is independent of the timing requirements of the facsimile software 130 or the application software 120. The user can again use one of the commonly available fax applications, rather than being forced to obtain a specific fax application for a specific fax/modem device 160.

Outgoing fax data and control information can also be stored in the computing system 110 to be sent at a later time at the user's convenience. Similarly, received fax data may be stored on the fax/modem device 160 until the computing system 110 has the resources available to upload the data. Thus, the fax will not fail if the computing system 110 is unable to upload the fax data at the time of reception.

In certain circumstances, the fax/modem device 160 will be able to upload the facsimile session directly to the fax spoofer software 140 and to the computing system 110 for later processing by the fax spoofer software 140 to a facsimile. Or, the fax spoofer software 140 may act as a modem emulator to an application program requesting the facsimile as stored in the session memory 180. Again, the fax will not fail if the computing system 110 is unable to upload fax data at the time of reception.

Many computing systems may use several fax/modem devices for communication. Accordingly, the depiction of the fax/modem device 160 represents either one or a plurality of such devices, each with a link to the telephone network 195. These multiple modems may be used independently thereby linking several different remote users to a single computing device, in conjunction with each another in a "shotgun modem" configuration, or in feasible combination.

FIG. 2 is a functional block diagram of the fax spoofer software 140 of FIG. 1. The fax spoofer software 140 contains an application interface software component 210 and a fax application interface component 220. Together, the components 210 and 220 correspond to the application mode software 147 depicted in FIG. 1. The fax spoofer software 140 communicates with user level applications through the application interface software 210 and the fax application interface 220. Typically, the associated application interface software 210 and the fax application 220 interfaces that communicate with the fax spoofer software 140 will do so blindly, that is, the application interface software 210 or the fax application interface 220 does not realize that it is communicating with an emulator for a fax/modem device 160 (FIG. 1).

The fax spoofer software 140 may also contain a system interface software component 230, which allows the fax spoofer software 200 to communicate directly with an operating system to request functional calls or transmissions from the operating system. The system interface software component corresponds to the kernel mode software 145 depicted in FIG. 1.

The fax spoofer software 140 also contains a software control scheduler component 240, which corresponds to the scheduling software 149 of FIG. 1. The software control scheduler 240 allows a user to schedule times to poll the session memory 180 depicted in FIG. 1 for incoming faxes, or to schedule times to send outgoing faxes, thereby allowing a user to efficiently customize the computing system 110 (FIG. 1) and communication links from the user's computing device to the external environment.

The software control scheduler 240 may also communicate with other computers and have entries for those computers. Remote computers schedule parameters for associated computers, essentially making the computer running the fax spoofer software 140 a facsimile "hub" for the other remote computing devices. Thus, the fax spoofer software 140 may allow a single fax/modem computing system to act as a fax/modem hub serving many remote users, for both transmission and reception.

With the multiple modems described above in relation to FIG. 1, the computing system 110 may be linked to numerous other computing systems. Accordingly, with either one or several fax/modem links, a computing system 110 employing the fax spoofer software 140 depicted in FIGS. 1 and 2 may serve as a fax/modem hub for other linked computing systems.

The fax spoofer software 140 also contains a modem emulation software component 250. The modem emulation software 250 may contain a class 1 or class 2 fax emulation software component 255, or both class 1 and class 2 fax emulation components, depending upon the particular configuration of the fax/modem device 160. Fax requests originating from a computing system 110 are routed to the modem emulation software 250. If the attached fax/modem devices are unavailable, the fax data is stored in the computing system 110. The modem emulation software 250 parses the incoming modem data requests into data and control sets. Thus, the modem functionality is accomplished in either real-time or semi-real time, which allows an outgoing transmission that would otherwise fail to transmit successfully at a later time, to transmit regardless of a com-link's timing requirements or to transmit whether or not the firmware has implemented class 1 or class 2 protocols.

The fax spoofer software 140 also contains a fax cache 260. The fax cache 260 contains a slot 270*a* for a "Message 1." The slot 270*a* contains a data slot 271*a* and a control slot 272*a*. In a similar fashion, the fax cache 260 contains a slot 270*b* for a "Message 2", which contains a data slot 271*b* and a control slot 272*b*; and so on, up to a slot 270*n* for a "Message N" that contains a data slot 271*n* and a control slot 272*n*. Thus, when the modem emulation software 250 interacts with an external facsimile application or any other application attempting to transmit a facsimile, the modem emulation software 250 separates the session into data and control portions. The facsimile message is then stored in a slot in the fax cache 260. The various components are stored in the appropriate control and data slots within the appropriate message slot in the fax cache 260.

Multiple message slots are available in the fax cache 260, thereby allowing for the efficient queuing, buffering and spooling of multiple incoming and outgoing facsimiles.

When an incoming facsimile is routed from the fax/modem device 160 to the fax spoofer software 140, the fax spoofer software 140 determines if the associated computer system 110 can process the incoming fax at the present time. That is, the computing device 110 may be busy, appropriate fax software may not be running, auto-answer may be turned off, or the software control scheduler 240 may have enabled fax spooling.

If the computing system 110 is not able to handle the incoming reception, the fax spoofer software 140 will upload the communication session from the associated fax/modem device into one of the message slots in the fax cache 260. Both incoming and outgoing facsimiles may be buffered, queued and spooled because the fax session cache 260 can store both incoming and outgoing fax data simultaneously. If desired, separate fax session caches may be employed; or the fax spooler software 140 may instruct the fax/modem device 160 to print the incoming fax.

FIG. 3 is a combination flow diagram and functional block diagram 300 describing the possible components of

the fax spoofer software **140** of FIG. **1**. The computer system **110** employs application software **310**. The application software **310** may include a direct fax application software component **330** and a user application software with fax interface component **320**.

The computing system **110** can communicate with the fax spoofer software **140** when the fax/modem device **160** is unavailable, which may be accomplished through an application interface software component **340** and a fax application interface **345**. Typically, the application interface software component **340** and the fax application interface **345** do not realize that they are communicating with an emulator for a fax/modem device.

Facsimile data flows from the application software **310** to the application interface software **340**, which may be accomplished via any method or device that mimics the operation of the fax/modem device **160**. For example, in a Microsoft Windows® operating system environment this may be accomplished through the use of an interface such as a VCOMM-type interface or a TAPI-type interface.

The fax application software **330** and user application software with fax interface **320** believe that they are in communication with an actual fax/modem device. As such, data flows from the application software **310** to the fax/modem spoofer software **140** through the application interface software **340**.

Typically, the application software **310** sends class 1 or class 2 fax/modem commands to the specified fax/modem device **160**. Because the application software **310** has accessed a fax/modem device, albeit one that emulates and stores the commands, including AT commands for the fax/modem, data is transmitted between the application interface software **340** and a modem emulation software component **350**.

The modem emulation software **350** sends appropriate responses from the attached fax/modem device **160** back to the application software **310**. This occurs while the modem emulation software **350** is capturing and storing the fax/modem commands from the application software **310**. The modem emulation software **350** may contain software, including a class 1 or class 2 fax emulation software component **355**, that enables it to successfully emulate the activities of attached fax/modem devices.

To the application software **310**, the fax/modem spoofer software **140** appears to be a typical class 1 or class 2 fax/modem, that is, the modem emulation software **350** acts as a virtual fax/modem. At this point, a bi-directional communication channel is open between the application software **310** and the modem emulation software **350**.

The modem emulation software **350** communicates a session log of the requested fax transmission, including both data and control signals to a session storage **360**. The fax transmission, as well as any number of outgoing transmissions, may be stored for later transmission to the currently unavailable fax/modem device **160** for eventual delivery over an available telephone network.

At the appropriate time the fax/modem spoofer software **140** transfers the stored transmission sessions from the session storage **360** to the fax/modem device **160** through an appropriate device transfer software component **370**. The criteria for the fax/modem spoofer software **140** transfer the stored transmission sessions from the session storage **360** may include the amount of data in the session storage **360**, the availability of the fax/modem device **160**, the availability of the communications link between the fax/modem spoofer software **140** and the fax/modem device **160**, or a user-specified schedule.

FIG. **4** is a data flow diagram **400** of the possible operation of the fax spoofer software **140** of FIGS. **1–3**. Control proceeds from a Start block to a block **410** in which the fax spoofer software **140** awaits an indication that a fax has been initiated from a host application. Once the fax has been initiated, control proceeds to a block **420** and then immediately to a block **460** in which the fax spoofer software **140** determines whether the associated fax/modem device **160** is busy. This determination in block **460** may involve deciding whether the connection to the fax/modem device **160** is available, whether a non-standard communication link, such as a USB or an IEEE 1284 parallel port connection, is being employed, or whether the fax/modem device **160** is engaged in other tasks, such as transmitting or receiving a fax, or serving as a fax/modem to the computing system **110**.

If the fax spoofer software **140** determines that the fax can not be transmitted to the fax/modem device **160** on a real-time basis from the application software initiating such a request, then control proceeds to a block **470** in which the fax spoofer software **140** initiates a fax spoofer emulation. The fax spoofer software **140** may be configured to handle all faxes regardless of whether or not the fax/modem device **160** is available on a real-time basis. In this configuration, the fax/modem device **160** does not need to implement either class 1 or class 2 protocols and is thus can be simpler, and perhaps cheaper, than a typical fax/modem device. Control then proceeds to a block **475** in which the fax spoofer software **140** communicates with the host software and stores a fax session for later transmission to the associated fax/modem device **160**.

The sessions created by the emulator software may be stored in a queue, allowing for the storage of multiple incoming or outgoing facsimile sessions. After creating a stored version of a facsimile session and the destination phone number of the session, control proceeds to the block **410** in which the fax spoofer software **140** resumes awaiting a fax initiation.

If in the block **460** the fax/modem **160** is not busy, control proceeds to a block **465** in which the fax spoofer software **140** determines whether any scheduling has been enabled. If a schedule is enabled for the fax/modem and computing system, control transfers to the block **470** and then immediately to block **475** in which the fax spoofer software **140** emulates a fax/modem session with the host software. The fax spoofer software **140** then creates and stores a fax session for later transmission to the associated fax/modem device **160**. Control again returns to the block **410** to await a fax initiation.

If in the block **465**, the fax spoofer software determines that scheduling has not been enabled, control proceeds to a block **475** in which the fax spoofer software **140** simply connects the requesting application software with the host software.

In block **410**, while awaiting fax initiation, the fax spoofer software **140** may determine that the stored fax/modem sessions are to be transferred to the associated fax/modem device **160** through the use of a preset schedule as indicated by a block **415**. In this case, when a transmission of the fax sessions is scheduled, control transfers to a block **425** in which the fax spoofer software determines if any fax sessions are buffered for transmission at that time. If no sessions are currently stored for later transmittal, the fax spoofer software simply returns to the wait state in block **410**.

If the fax spoofer software **140** has fax sessions stored for transmission to the associated fax/modem device **160**, con-

trol proceeds to a block **430** in which the fax spoofer software **140** sends a fax/modem session to the fax/modem device **160**. If the session is transmitted successfully, as indicated in a block **435**, then control proceeds to a block **455** in which the fax spoofer software **140** attempts to retrieve any other sessions present in the buffer for transmittal to the fax/modem device **160**. Control returns to the block **425** to determine if another session is present in the buffer.

If no other fax/modem sessions are stored, control returns to block **410** in which the fax spoofer software **140** resumes waiting. If other fax/modem sessions are present, control proceeds to block **430** in which the fax spoofer software **140** communicates the next fax/modem session to the fax/modem device **160**. This process continues until all the stored sessions are transmitted.

If, in block **430**, a session is not properly transmitted to the fax/modem device **160**, as indicated by a block **440**, control proceeds to a block **445** in which the fax spoofer software **140** logs an error. Control then proceeds to block **455** in which the fax spoofer software **140** attempts to access the next stored session.

FIG. **5** is a flow diagram **500** detailing the operation of scheduled transmissions of stored facsimile sessions by the fax spoofer of FIG. **2**. In the computer system **110** of FIG. **1**, control proceeds from a Start block to a block **510** in which the fax spoofer software **140** awaits an initiation of fax scheduling or spooling. If no fax scheduling is initiated, the scheduler may transmit fax/modem sessions to an attached fax/modem device upon either request by an application or by communication through polling techniques.

Control then proceeds to a block **520** in which scheduling of fax sessions is initiated, and the fax spoofer software **140** intercepts and processes all fax sessions and stores the sessions in a buffer or queue, as described above, until the scheduled time for transmission as indicated in a block **530**, in which the spooling mechanism of the fax spoofer software **140** waits until the scheduled transfer time.

If, as indicated in a block **540**, the fax spoofer software **140** determines that it is time to send the spooled faxes contained in the fax session queue, control proceeds to a block **560**. In block **560**, the fax spoofer software **140** determines whether any fax/modem sessions are available to transmit to the fax/modem device **160**.

If fax/modem sessions are present for transmission to the associated fax/modem device **160** in the fax session queue, control then proceeds to a block **580** in which the fax session is transmitted to the appropriate fax/modem device **160**, from which the fax data is subsequently sent to a remote party. Control then proceeds to a block **590** in which the next available outgoing fax/modem session in the fax session queue is selected, and control then proceeds to the block **560** to determine whether the next selected session is a valid session for transmittal to the associated fax/modem device **160**.

If no further sessions are available in the fax session queue, then control proceeds to a block **570** in which the fax spoofer software **140** determines whether the fax scheduling has been disabled in the interim. If the fax scheduling has been disabled, then control reverts to the block **510** in which the fax spoofer software **140** simply awaits the initiation of the fax scheduling. If the scheduling mechanism has not been disabled, control reverts to the block **530**, in which the fax spoofer software **140** simply intercepts any outgoing fax transmissions for later transmittal to the fax/modem device **160**.

If, in the block **530**, the fax spoofer software **140** receives a signal to indicate that the fax scheduling is to be disabled, as indicated in a block **550**, control proceeds to the blocks **560**, **570**, **580** and **590** in which the fax spoofer software **140** functions as explained above.

FIG. **6** is a combination flow diagram and functional block diagram **600** describing the possible components of the fax spoofer software **140** of FIG. **1** during the receipt of an incoming facsimile from the fax/modem device **160**. An incoming facsimile is typically detected by the fax/modem device **160** and the fax/modem device **160** then initiates communication with the fax spoofer software **140**.

The fax spoofer software **140** retains communication to the fax/modem device **160** through the device transfer software component **370** (FIG. **3**). In this instance, the fax/modem session is stored to the session storage **360**. The fax/modem device **140** may buffer incoming data for a period of time before transmitting all of the data to the session storage **360** in an intermittent manner, thereby minimizing timing problems often associated with non-standard communications links.

At a later time, the fax spoofer software **140** initiates full communication with the ultimate recipient of the facsimile, namely the application software **310**, which again may be the facsimile application software component **330**, or the user application software with fax interface component **320**.

The fax spoofer software **140** communicates with the application software **310** via the application interface software component **340** and the fax application interface **345**, described above in conjunction with FIG. **3**. The modem emulation software component **350** operates on fax/modem sessions stored in a session storage **360**. The modem emulation software **350** may contain software, including a class 1 or class 2 fax emulation software component **355**, that enables it to successfully emulate the activities of the attached fax/modem devices. To the application software **310**, the modem emulation software appears to be a fax/modem device. The facsimiles stored in the session storage **360** are relayed to the recipient application software **310** in a dynamic, non-real time manner, without having the facsimile transmission fail due to the unavailability of system resources or because of delays in the communication line.

FIG. **7** is a data flow diagram **700** of an additional possible operation of the fax spoofer software **140** of FIGS. **1–3**. Control proceeds from a Start block to a block **710** in which the fax spoofer software **140** awaits an indication that a fax has been initiated by an attached fax/modem device **160**. After the fax has been initiated from a fax/modem device **160**, as indicated in a block **715**, control proceeds to a box **725** in which the fax spoofer software **140** determines whether the associated application is busy. This determination may involve deciding whether the connection to the fax/modem device **160** is available, whether a non-standard communications link, such as a USB connection or an IEEE 1284 parallel port connection, is being employed, or whether the computing device **110** simply can not process the incoming fax on a real time basis. The computing device may also be configured to handle all incoming faxes through the fax spoofer software **140** because the fax/modem device **160** would not then need to implement either the class 1 or class 2 protocols.

If the fax spoofer software **140** determines that the fax can not be transmitted to the computing device **110** on a real time basis or the fax spoofer **140** is configured to handle all faxes, control proceeds to a block **727** in which the fax spoofer software **140** initiates a fax spoofer emulation. Control then

proceeds to a block **730** in which the fax spoofer software **140** communicates with the fax/modem device **160**. In block **730**, the emulation software **250** of the fax spoofer **140** creates and stores a fax session for later communication to the computing device **110**.

The sessions created by the emulator software **250** may be stored in a queue, allowing for the storage of multiple incoming or outgoing facsimile sessions. After storing a version of a facsimile session, control proceeds to block **710** in which the fax spoofer software **140** resumes waiting for a fax initiation.

If in box **725**, the fax/modem is not busy, control transfers to the block **730**, in which the fax spoofer software **140** emulates a fax/modem session for the incoming data. The fax spoofer software **140** creates and stores a fax session for later transmission to an associated fax/modem device **160**. Control then returns to block **710** to await another fax initiation.

In the block **710**, while awaiting an action, the fax spoofer software **140** may determine that the stored fax/modem sessions are to be transferred to the computing device **110** through the use of a preset schedule, as indicated in a block **720**. When transmission of the fax sessions is scheduled, control proceeds from block **720** to a block **745** in which the fax spoofer software **140** determines if any fax sessions are buffered in the computing system **110**. If no sessions are currently stored, control proceeds to block **710** in which the fax spoofer software **140** simply returns to the wait state.

If, in block **745**, the fax spoofer software **140** has any stored fax sessions for transmission to recipient application software, control proceeds to a step **750** in which the fax spoofer software **140** emulates a fax/modem session to the fax/modem device **160**. Control then proceeds to a block **755** in which any additional fax/modem sessions are retrieved and a determination is made as to whether any fax sessions were stored while control was in the block **745**. Accordingly, all incoming facsimiles are either routed to the appropriate application software on the computing device **110** or stored for later processing.

FIG. **8** is a combination flow diagram and functional block diagram **800** describing additional possible components of the fax spoofer software **140** of FIGS. **1–3**. The corresponding details of the diagram **800** are substantially similar to the details described in relation to FIGS. **3** and **6** above, with the additional feature of the computer system **110** being able to interact with a resident memory device **865** in a fax/modem device **860**.

The communications with the application software and the emulation of the fax/modem are the same as detailed in relation to FIG. **3** above. But, when the outgoing transmission is stored, the session may be dynamically stored to either a session storage **380** or a modem session storage **865**. Thus, the system described in FIG. **8** may dynamically interact with the fax/modem device **860** when encountering non-standard communications techniques or intermittent communications problems. The fax/modem may process and transmit the data stored at either session storage location.

FIG. **9** is a data flow diagram **900** of the possible operation of the fax spoofer software **140** of FIGS. **1–3**. Control proceeds from a Start block to a block **910** in which the fax spoofer software **140** awaits initiation of a fax by a host application. If a fax has been initiated in a block **914**, control proceeds to a block **915** in which the fax spoofer software **140** determines whether the associated fax/modem device **160** is busy. This determination of whether the fax/modem device **160** is busy may entail factors such as deciding whether the connection to the fax/modem device **160** is available, whether a non-standard communication link is being employed, or whether the fax/modem device **160** is engaged in other tasks, such as transmitting or receiving a fax, or serving as a modem to the computing system **110**.

If the fax spoofer software **140** determines that the fax can not be transmitted to the fax/modem device **160** on a real time basis or the fax spoofer software **140** is configured to handle all faxes, control proceeds to a block **930** in which the fax spoofer software **140** initiates a fax spoofer emulation. Control then proceeds to a block **935** in which the fax spoofer software **140** determines whether the storage of the session should be made locally or in the fax/modem device **160**. Based on this determination, control proceeds to either a block **940** or **945** in which the fax spoofer software **140** communicates with the application program and stores the fax session data as appropriate. After creating and storing a version of a facsimile session, control then proceeds to block **910** in which the fax spoofer software **140** resumes waiting for fax initiation.

If, in block **915**, the fax/modem device **160** is not busy, control proceeds to a block **920** in which the fax spoofer software **140** determines whether any scheduling has been enabled. If the fax/modem device **160** and the computing system **110** are operating under a schedule, control proceeds to a block **925** in which the fax spoofer software **140** stores all of the sessions locally. The fax spoofer software **140** creates and stores a fax session for later transmission to the associated fax/modem device **160**, as detailed above. Control then returns to block **910** in which the fax spoofer software **140** awaits fax initiation.

In the block **920**, if the fax spoofer software determines that scheduling has not been initiated, control proceeds to a block **945** in which the fax spoofer software **140** simply stores the fax session in the fax spoofer software **140**. Control then returns to block **910** in which the fax spoofer software **140** awaits fax initiation.

In the block **910**, while awaiting an action, the fax spoofer software **140** may determine that the stored fax/modem sessions are to be transferred to the associated fax/modem device **160** according to a preset schedule, as indicated in a block **912**. When transmission of the fax sessions is scheduled, control transfers to a block **955** in which the fax spoofer software **140** directs the transmission of any remaining previously stored sessions in the fax/modem device **160**.

Control then proceeds to a block **960** in which the fax spoofer software **140** determines if any fax sessions are locally stored for transmission. If no sessions are currently stored for later transmittal, control returns to block **910** in which the fax spoofer software **140** enters a wait state as described above.

If stored fax sessions are available for transmission to the associated fax/modem device **160**, control proceed from block **960** to a block **965** in which the fax spoofer software **140** sends a fax/modem session to the fax/modem device **160**. If the session is transmitted successfully, as indicated in a block **975**, then control proceeds to a block **980** in which the fax spoofer software **140** attempts to retrieve any other sessions present in the session buffer for transmittal to the fax/modem device **160**. Control returns to the block **960** in which the fax spoofer software **140** determines whether another session is actually present in the host buffer.

If, in block **965** a stored fax/modem session is not correctly transmitted to the fax/modem device **160**, as indicated by a block **970**, control proceeds to a block **985** in

which the fax spoofer software **140** logs an error. Control then proceeds to a block **955** in which the fax spoofer software **140** attempts to access and send the next stored session in the block. Thus, the fax spoofer software **140** communicates each of the fax/modem sessions to the fax/modem device **160** and continues until all of the stored sessions are transmitted.

FIG. **10** is a combination flow diagram and functional block diagram **1000** describing the possible components of the fax spoofer software **140** of FIGS. **1–3** during the receipt of an incoming facsimile from a fax/modem device having its own session storage area such as the fax/modem device **860** (FIG. **8**). An incoming facsimile is detected by the fax/modem device **860**. The fax/modem device **860** then initiates communication with the fax spoofer software **140**.

If the computer device **110** is unable to initiate a direct link to an application software **310**, the fax spoofer software **140** may relay the communication from the fax/modem device **860** through a device transfer software component **370** to a session storage **380**. The fax spoofer software **140** may also direct the fax/modem device **860** to store the session in a fax/modem session storage area **365**. Thus, the communication session is selectively routed to a particular session storage area.

At a later time, the fax spoofer software **140** is able to initiate full communication with the ultimate recipient of the facsimile, namely the application software **310**, which again can be a facsimile application software component **330**, or a user application software with fax interface component **320**.

The fax spoofer software **140** communicates with the application software **310** via an application interface software component **340**, described previously in relation to FIG. **3**. A modem emulation software component **350** operates on fax/modem sessions stored in the session storage **380**. To the application software **310**, the modem emulation software appears to be an actual fax/modem device. Thus, the facsimiles stored in the session storage **360** are relayed to the recipient application software **310** in a dynamic, non-real time manner, without having the facsimile transmission fail due to the unavailability of system resources The session data is relayed to the modem emulation software **350** from the fax/modem session storage **365** on the fax/modem device **860**. The fax spoofer software **140** can selectively direct the storage of fax sessions so as to minimize impact on either the computing system **110** or the fax/modem device **860**, or both.

FIG. **11** is a data flow diagram **1100** of the possible operation of the fax spoofer system **140** of FIGS. **1–3**. Control proceeds form a Start block to a block **1110** in which the fax spoofer software **140** awaits initiation of a fax by the attached fax/modem device **860** (FIG. **8**). Once the fax has been initiated, as indicated by a block **1120**, control proceeds to a block **1125** in which the fax spoofer software **140** determines whether the associated computing device **110** is busy. This determination may entail deciding whether the connection to the fax/modem device **860** is available, whether a non-standard communication link is being employed, or whether the fax/modem device **860** is engaged in other tasks, such as transmitting or receiving a fax, or serving as a modem to the computing system **110**.

If the fax spoofer software **140** determines that the fax can not be transmitted to the computing device **110** on a real time basis or the fax spoofer software **140** is configured to handle all faxes, control proceeds to a block **1135** in which the fax spoofer device **140** determines whether to buffer the incoming data on the host system or on the fax/modem device **860**. Control then proceeds to either a block **1140** or a block **1145** depending upon the status of components of the computer system **110**. Control then returns to block **1110** in which the fax spoofer software **140** awaits fax initiation.

In block **1125**, if the fax/modem is not busy, control proceeds to a block **1130** in which the fax spoofer software **140** determines whether any scheduling has been initialized. If the fax/modem device **860** or computing system **110** are operating under a schedule, control again transfers to the block **1135** and then proceeds to either block **1140** or block **1145** in which the incoming data is stored, as appropriate. Control then returns to block **1110** and the fax spoofer software **140** returns to the wait state. In block **1130**, if the fax spoofer software **140** determines that scheduling is not initiated, control proceeds to block **1145** in which the fax spoofer software **140** simply stores the fax session in the modem buffer **865** (FIG. **8**).

While awaiting an action with control in block **1110**, the fax spoofer software **140** may determine that the stored fax/modem sessions are to be transferred to the computing device **110** through the use of a preset schedule, as represented by a block **1115**. When a transmission of the fax sessions is scheduled, control proceeds from block **1115** to a block **1155** in which the fax spoofer software determines if any fax sessions are stored for the computing system **110**. If there are stored sessions, control proceeds to a block **1160** in which the stored sessions are processed through the emulation software and to the recipient application. Control then proceeds to a block **1165** in which the next session in the buffer is sought and then returns to block **1155**.

If no sessions are currently stored in the session storage **260** (FIG. **2**) associated with the fax spoofer software **140**, control proceeds to a block **1170** in which the fax spoofer software **140** determines whether the fax/modem buffer has stored sessions from the fax/modem device **860**. These sessions are processed in a manner similar to that described above in relation to fax sessions residing in a local buffer, as illustrated in a block **1175** and a block **1180**. When all of the fax/modem stored sessions are processed, control returns to block **1110** in which the fax spoofer software **140** enters the wait state.

Fax/modem sessions may be stored for subsequent transmission in a multitude of scheduling schemes. Faxes may be scheduled or ordered by time, priority, or by a combination of these and other factors. Schedule disabling is available to limit fax usage of the computing device **110**. For example, the computing system **110** and associated fax/modem device **160** or **860** may allocate five minutes per hour to send and receive faxes and may increase that amount after normal business hours have ended. If the stored sessions are not sent during the allocated time, the sessions remain in storage for transmission at a later time.

Schedules for messages of varying priority may also be defined. For example, high priority messages may be scheduled for transmission every half hour, while low priority messages may be scheduled to transmit every three hours. The fax spooling and scheduling features allow precise scheduling of outgoing faxes, while insuring that initiating applications will not be impeded by a lack of system resources.

FIG. **12** is a schematic block diagram **1200** of the present invention in a network environment where a fax "hub" is created. A "Client Computer 1", a "Client Computer 2", through a "Client Computer N" (**1210***a*, **1210***b*, and **1210***n*, respectively) each contain portions of the fax spoofer soft-

ware (**1215***a*, **1215***b* and **1215***n*, respectively) described in the preceding figures. Through this interlinking of computer systems, a fax "hub" system can be created to serve a multitude of individual computers.

For example, when the "Client Computer 1" **1210***a* attempts to send a facsimile to a remote party, the "Client Computer 1" **1210***a* may process the outgoing facsimile through the interface and emulation portions contained in the resident fax spoofer software component **1215***a*. The fax spoofer software **1215***a* stores the outgoing sessions either locally in the "Client Computer 1" **1210***a* or may transmit such a session across a network **1220** to a fax hub computer **1230**.

The fax hub computer **1230** may contain portions, either in whole or in part, of a fax spoofer software component **1235** as described in the previous figures. The session may be stored by the fax hub computer **1230** in a memory associated with the fax spoofer software **1235**, within a fax/modem device **1238**, or within the resident fax spoofer software **1215***a*. A scheduling mechanism, described above in detail, may exist on either the "Client Computer 1" **1210***a* or on the fax hub computer **1230**.

A multitude of client computers, for example, "Client Computer 2" **1210***b* through "Client Computer N" **1210***n*, representing any number of attached computers, may also be connected to the fax hub computer **1230** via a network **1220**. Accordingly, an entire system of non-real time fax transmissions may be initiated for multiple computers across network connections, or across other communications interfaces. Thus, the fax hub computer **1230** may act as a centralized point of contact with a telephone network.

This arrangement alleviates interruptions in the transmission of faxes via fax/modems on each individual client computer. Additionally, should the network connection to the fax hub computer **1230** become congested for whatever reason, storage and/or emulation may occur in the client computers, thereby avoiding additional problems and delays. In addition, a delay of the transmission may be desirable because outside lines are at a premium.

Both incoming and outgoing facsimile transmissions can be processed over the network **1220** in a manner substantially similar to that described above in the preceding figures in relation to a single computing device. Storage, processing or any combination thereof, of incoming and outgoing transmissions may take place on the network-based spoofer system. This enhances efficient usage of the modem fax device **1238**, and allows for efficient scheduling and communication queuing for the associated client computers on the network **1220**.

Both the operation of the fax hub spoofer **1235** and the fax client computers may be implemented through methods similar to those described in FIGS. **2–11** above. As shown, the networked spoofer software may operate across any wired or wireless network, which includes Wide Area Networks (WAN's), Local Area Networks (LAN's) and the Internet.

Thus, a dynamic buffering, queuing and spooling system is described for the non real-time transmission and receipt of facsimiles. The non-real time fax transmission and reception system may be implemented on a single, stand-alone computing device or in conjunction with a networked environment, thus creating a multi-user modem interface for a computer network. In view of the above detailed description of the present invention and associated drawings, other modifications and variations will now become apparent to those skilled in the art. It should also be apparent that such other modifications and variations may be effected without departing from the spirit and scope of the present invention as set forth in the claims which follow.

We claim:

1. A facsimile transmission system for a computer system communicatively coupled to a modem capable of acting as a facsimile device, the facsimile transmission system comprising:

a computer system interface, communicatively coupled to the computer system, that receives data for an outgoing facsimile transmission through the modem;

a modem emulator, communicatively coupled to the computer system, that receives data from the computer system for transmission as a facsimile through the modem;

a modem interface, communicatively coupled to the modem emulator, that passes the data received and stored by the modem emulator to the modem; and

the modem emulator emulating the modem to the computer system when the computer system requests to send a facsimile through the modem.

2. The fax transmission system of claim **1** further comprising a facsimile session queue, communicatively coupled to the modem emulator, that stores the data received from the computer system for transmission.

3. The fax transmission system of claim **1** further comprising a scheduler, communicatively coupled to the modem interface, that sends the data received from the computer system to the modem based on a preselected criteria.

4. The fax transmission system of claim **3** wherein the preselected criteria is a number of facsimile messages to be sent.

5. The fax transmission system of claim **4**, further comprising a facsimile session queue, communicatively coupled to the modem emulator, that stores the data received from the computer system for transmission, and wherein the preselected criteria is an amount of storage space in the session queue for the received data.

6. The fax transmission system of claim **3**, wherein the preselected criteria is a set time.

7. The fax transmission system of claim **1**, wherein the modem emulator comprises a class 1 facsimile machine emulator.

8. The fax transmission system of claim **1**, wherein the modem emulator comprises a class 2 facsimile machine emulator.

9. The fax transmission system of claim **1**, wherein the modem emulator stores the data when the modem is otherwise occupied.

10. The fax transmission system of claim **1** wherein the modem emulator transmits the data to the modem at a later time than it receives the data from the computer system.

11. The fax transmission system of claim **1**, wherein the modem stores incoming data from other facsimile devices, and the modem emulator emulates a modem upon that data in communicating that data from other facsimile to the computer system.

12. A method of operating a facsimile device on a computing system, the computing system communicatively coupled to a modem, the method comprising:

receiving a request to transmit a facsimile from the computing system;

checking the availability of the modem to transmit the facsimile;

emulating a modem to computing system; and

transmitting the facsimile at a later time.

13. The method of claim **12**, the step of checking comprising:

checking a scheduler to determine if the modem can send the facsimile at the time of requesting.

14. The method of claim **12** further comprising a step of receiving and storing the facsimile data in a session buffer.

15. The method of claim **12** further comprising scheduling the step of transmitting based upon a preselected criteria.

16. The method of claim **12**, wherein the modem is communicatively coupled to the computing system over a network.

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